CLAIMS

What is claimed is:

1. An optical transmission system comprising:

an optical transmitter configured to transmit at least one signal wavelength and a tuning wavelength;

an optical receiver including an optical filter having a filter bandwidth including the at least one signal wavelength and a percentage of the tuning wavelength, and an optical to electrical signal converter configured to receive the at least one signal wavelength from said filter;

a first tuning optical to electrical converter configured to receive a first portion of the tuning wavelength stopped by said filter;

a second tuning optical to electrical converter configured to receive a second portion of the tuning wavelength passed by said filter; and,

a filter controller configured to tune the filter bandwidth based on the relative proportion of first and second portions of the tuning wavelength provided to the first and second tuning optical to electrical converters.

2. The system of claim 1, wherein said filter includes a Bragg grating configured to reflect the at least one signal wavelength and the first portion of the tuning wavelength and transmit the second portion of the tuning wavelength.

3. The system of claim 2, wherein said Bragg grating is configured to reflect and transmit 50% of the tuning wavelength.

4. The system of claim 1, wherein said filter includes a Bragg grating configured to transmit the at least one signal wavelength and the first portion of the tuning wavelength and reflect the second portion of the tuning wavelength.

5. The system of claim 1, wherein said filter controller includes a temperature controller configured to thermally tune said optical filter.

6. The system of claim 1, wherein said filter controller includes a strain controller configured to tune the optical filter by varying at least one of compressive strain and tensile strain applied to said filter.

7. The system of claim 1, wherein said transmitter includes an optical source providing optical energy at a carrier wavelength, and said transmitter is configured to transmit one signal wavelength at the carrier wavelength and the tuning wavelength on a subcarrier wavelength of the optical source.

8. The system of claim 1, wherein said transmitter includes an optical source providing optical energy at a carrier wavelength, and said transmitter is configured to transmit at least one signal wavelength on a subcarrier wavelength of the carrier wavelength and the tuning wavelength on the carrier wavelength.

9. The system of claim 1, wherein said receiver includes a local optical source configured to provide a local optical signal to said signal optical to electrical converter to down-convert the at least one signal wavelength.

10. The system of claim 9, wherein said filter has a filter bandwidth including a plurality of signal wavelengths;

said signal converter is configured to down-convert the plurality of signal wavelengths to a corresponding plurality of electrical signal frequencies.

11. A method of tuning an optical filter to an optical signal wavelength comprising:

providing an optical filter having a filter bandwidth including an optical signal wavelength and a portion of a tuning wavelength;

transmitting information via the optical signal wavelength and along with the tuning wavelength to said filter;

receiving a first portion of the tuning wavelength stopped by the filter and a second portion of the tuning wavelength passed by the filter; and,

tuning the filter based on the relative amount of the first and second received portions.

12. An optical receiver comprising:

an optical filter having a filter bandwidth including at least one signal wavelength and a portion of a tuning wavelength;

an optical to electrical signal converter configured to receive at least one signal wavelength from said filter;

a first tuning optical to electrical converter configured to receive one of a first portion of the tuning wavelength stopped by said filter and a second portion of the tuning wavelength passed by said filter; and

a controller configured to tune the filter bandwidth based on the portion of the tuning wavelength received by said first tuning converter.

13. The receiver of claim 12, wherein the first tuning converter is configured to receive a first portion of the tuning wavelength stopped by the filter and further comprising a second tuning optical to electrical converter configured to receive a second portion of the tuning wavelength passed by said filter, and wherein the controller is configured to tune the filter based on relative powers of the first and second portions of the tuning wavelength received by said first and second tuning optical to electrical converters.

14. The optical receiver of claim 13 further comprising:

a first optical splitter configured to provide the first portion to the first tuning optical to electrical converter; and

a second optical splitter configured to provide the first portion to the second tuning optical to electrical converter.

15. The optical receiver of claim 12 further comprising a first optical circulator configured to provide the first portion of the tuning wavelength and the at least one signal wavelength to the optical to electrical signal converter.

16. The optical receiver of claim 13, wherein said optical to electrical signal converter and said first and second optical to electrical tuning converter include photodiode detectors.

17. An optical transmission system comprising:

at least one optical transmitter configured to transmit at least one signal wavelength and a tuning wavelength;

an optical receiver including an optical filter having a filter bandwidth including the at least one signal wavelength and a percentage of the tuning wavelength and an optical to electrical signal converter configured to receive the at least one signal wavelength from said filter;

a tuning optical to electrical converter configured to receive a first portion of the tuning wavelength from said filter; and,

a filter controller configured to tune the filter bandwidth based on the first portion of the tuning wavelength power and a tuning wavelength set point power.

18. A method of transmitting and receiving information, comprising:

transmitting the information via an optical signal wavelength;

transmitting a tuning signal via an optical signal wavelength;

filtering the information and the tuning signal with an optical filter;

converting a portion of the tuning signal into an electrical tuning signal;

tuning the optical filter in response to the electrical tuning signal; and

converting the information into an electrical information signal.

19. The method of claim 18, wherein filtering the information is selected from a group consisting of reflecting the information with the optical filter and passing the information through the optical filter.

20. The method of claim 18, wherein filtering the tuning signal is selected from a group consisting of reflecting a portion of the tuning signal with the optical filter, and passing a portion of the tuning signal through the optical filter.

21. The method of claim 18, wherein:

filtering includes reflecting the information signal, reflecting a first portion of the tuning signal, and passing a second portion of the tuning signal.

22. The method of claim 21, wherein converting the tuning signal includes converting one of the first and second portions of the tuning signal.

23. The method of claim 21, wherein converting the tuning signal includes converting both the first and second portions of the tuning signal.

24. The method of claim 18, wherein tuning the filter is selected from a group consisting of controlling temperature of the filter and controlling strain of the filter.

25. The method of claim 18, wherein tuning the filter includes tuning the filter to maintain a predetermined electrical tuning signal.

26. The method of claim 25, wherein tuning the filter includes tuning the filter to maintain a first electrical tuning signal equal to a second electrical tuning signal.

27. The method of claim 25, wherein tuning the filter includes tuning the filter to maintain the electrical tuning signal within a predetermined range.

28. A method of receiving information transmitted via an optical signal wavelength and transmitted with a tuning signal, comprising:

filtering the information and a portion of the tuning signal with an optical filter;

converting the portion of the tuning signal into an electrical tuning signal;

tuning the optical filter in response to the electrical tuning signal; and

converting the information into an electrical information signal.

29 An optical receiver comprising:

an optical filter having a filter bandwidth selective to an information signal wavelength, selective to a first portion of a tuning wavelength, and not selective to a second portion of the tuning wavelength;

an optical to electrical information signal converter having an optical input terminal configured to receive the information signal wavelength from the filter and having an electrical output terminal;

an optical to electrical tuning signal converter having an optical input terminal configured to receive one of the first and second portions of the tuning wavelength, and having an electrical output terminal; and

a filter controller having an input terminal and configured to adjust the filter; and

a controller having an input terminal connected to the output terminal of the tuning converter, and having an output terminal connected to the input terminal of the filter controller, and wherein the controller includes computer readable instructions which, when executed by the controller, cause the controller to perform the steps of:

reading a signal at the input terminal of the controller;

comparing the signal with a predetermined condition; and

sending a control signal to the filter controller depending on a relationship between the signal and the predetermined condition.